Effect of Combined Spaceborne Microwave and Continuous Lightning Measurements on Precipitation Forecasts of the 1998 Ground-Hog Day Storm

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Abstract

We evaluated the impact of several newly available sources of meteorological data on mesoscale model forecasts of precipitation produced by the extra-tropical cyclone that struck Florida on February 2, 1998. Precipitation distributions of *convective* rainfall events were derived from SSM/I [1] and TMI [2] microwave radiometric data by means of the Goddard PROFiling (GPROF) algorithm [3]. Continuous lightning distributions were obtained from sferics measurements [4,5] obtained from a network of VLF radio receivers. Histograms of coincident sferics frequency distributions were matched to those of precipitation to derive bogus *convective* rainfall rates from the continuously available sferics measurements. SSM/I and TMI microwave data were used to derive Integrated Precipitable Water (IPW) distributions. The TMI also provided sea surface temperatures (SSTs) of the Loop Current and Gulf Stream with improved structural detail.

A series of experiments assimilated IPW and latent heating from the bogus convective rainfall for six-hours in the MM5 mesoscale forecast model [6] to produce nine-hour forecasts of *all* rainfall as well as other weather parameters. Although continuously assimilating latent heating only slightly improved the surface pressure distribution forecast, it significantly improved the precipitation forecasts. Correctly *locating* convective rainfall was found critical for assimilating latent heating in the forecast model, but measurement of the rainfall *intensity* proved to be less important. The improved SSTs also had a positive impact on rainfall forecasts for this case. Assimilating bogus rainfall in the model produced nine-hour forecasts of radar reflectivity distributions that agreed well with coincident observations from the TRMM spaceborne precipitation radar, ground based radar and spaceborne microwave measurements.

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